IpAC Unit
interprofessional ambulatory care unit

ECU AUSTRALIA EDITH COWAN UNIVERSITY

Interprofessional learning through simulation

Making assumptions: *importance of communication in client assessment*

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

Health Simulation Centre

ECU AUSTRALIA EDITH COWAN UNIVERSITY

Table of Contents

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

Acknowledgements

This resource was developed by the Interprofessional Ambulatory Care Program (IpAC) at Edith Cowan University (ECU) in collaboration with the ECU Health Simulation Centre with funding provided by the Australian Government under the Increased Clinical Training Capacity (ICTC) Program.

Foreword

Professor Cobie J. Rudd
Pro-Vice-Chancellor (Health Advancement), and National Teaching Fellow 2011-12, Australian Government Office for Learning and Teaching
ECU

Australia's health workforce is facing unprecedented challenges. Supply won't meet demand, and the safety and quality of care remain key issues. The national health workforce agency, Health Workforce Australia (HWA), an initiative of the Council of Australian Governments (COAG), has been established to address the challenges of providing a workforce that meets the needs of our community – now and in the future.

Accordingly, ECU has set a priority on meeting these challenges, with a focus on the national health workforce reform agenda set out in the 2008 National Partnership Agreement (NPA) on Hospital and Health Workforce Reform.

In June 2010, ECU was awarded $4.6M from the Australian Government through a nationally competitive process under the ICTC Program, an initiative which aims to develop interprofessional learning and practice capabilities in the Australian health workforce.

The IpAC Program aims to complement traditional clinical placement activities with high quality interprofessional learning competency development and assessment, so that at the earliest point students gain exposure to best work practices within multidisciplinary teams that have the patient's individual needs as the focus.

Additionally, the IpAC Program has developed interprofessional learning resources and interprofessional health simulation challenges in collaboration with the ECU Health Simulation Centre. The ECU Health Simulation Centre is recognised internationally as a

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

specialist centre in providing human factors based sequential simulation programs using professional actors. Most simulated learning interactions revolve around a single moment, such as a patient's admission to the emergency department. What we provide at the ECU Health Simulation Centre is a sequential simulated learning event that follows the patient and carer's journey through the healthcare system, for example, from the accident site following a motor vehicle accident, to the emergency department, to a hospital ward, to their home and into the community for GP and allied health follow-up.

Human factors in health care are the non-technical factors that impact on patient care, including communication, teamwork and leadership. Awareness of and attention to the negative aspects of clinical human factors improves patient care.

ECU's involvement in national health workforce reform is all about playing a role that enables the health workforce to better respond to the evolving care needs of the Australian community in accordance with the NPA's agenda. The IpAC Program is an example of how we can work across sectors, nationally and internationally, to determine better ways of addressing the pressing issue of how best to prepare students for the workplace and thus assuring that health systems have safe, high quality health services.

Interprofessional Ambulatory Care Program

ECU's IpAC Program was established with support from the Australian Federal Government through funding from the ICTC Program. The IpAC Program aims to deliver a world-class interprofessional learning environment and community clinic that develops collaborative practice among health professionals and optimises chronic disease self-management for clients.

This is achieved through the provision of clinical placements within the multidisciplinary team at the IpAC Unit, a community clinic that develops communication and collaboration among health professionals and optimises chronic disease self-management for clients. Additionally, a range of clinical placements are offered at existing health facilities, where trained IpAC Program clinical supervisors provide clinical support and ensure the integration of interprofessional learning into each clinical placement.

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

The IpAC Unit, in collaboration with the ECU Health Simulation Centre, has developed a range of interprofessional learning through simulation resources. These learning resources are packages consisting of an audiovisual resource and a facilitator's manual, and aim to facilitate interprofessional learning and to support the participants in the development of interprofessional skills.

The interprofessional learning through simulation resources developed by the IpAC Program aim to provide health students and health professionals with the opportunity to learn with, from and about one another by engaging them in interactive live simulation events. These simulations encourage students and professionals to challenge themselves and each other in a safe learning environment.

ECU Health Simulation Centre

ECU houses the only fully functioning Health Simulation Centre of its kind in Western Australia, specifically designed and equipped to address the interprofessional learning needs of the health workforce and implementation of both state and national safety and quality frameworks.

The ECU Health Simulation Centre offers health workforce training and development specialising in clinical skills, human factors, and patient safety training for multidisciplinary health teams. Using a variety of educational techniques, including a broad range of simulation mannequins, professional actors and task trainers, ECU specialises in immersive simulation and observational learning. Supporting the ECU Health Simulation Centre are nursing, medical, paramedic and psychology academic and technical staff whose aim is to cultivate the development of competent and confident health professionals centred on enhancing patient safety.

Interprofessional learning

Interprofessional education occurs when two or more professions learn with, from and about each other in order to improve collaboration and quality of care (Centre for the Advancement of Interprofessional Education, 2002).

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

Interprofessional learning is the learning arising from interaction between students or members of two or more professions. This may be a product of interprofessional education or happen spontaneously in the workplace or in education settings (Freeth, Hammick, Reeves, Barr, & Koppel, 2005). It has been found that interprofessional education can improve collaborative practice, enhance delivery of services and have a positive impact on patient care (Canadian Interprofessional Health Collaborative (CIHC), 2008).

The World Health Organization (WHO) has recognised the importance of interprofessional education and collaborative practice in developing a health workforce that is able to meet the complex health challenges facing the world and assist in the achievement of the health-related Millennium Development Goals (World Health Organization, 2010). In developing its framework for action, the WHO have recognised that models of interprofessional collaboration are most effective when they consider the regional issues and priority areas (including areas of unmet need) in the local population (World Health Organization, 2010). In doing so, interprofessional education and collaborative practice can best maximise local health resources, reduce service duplication, advance coordinated and integrated patient care, ensure patient safety and increase health professional's job satisfaction (World Health Organization, 2010).

The end goal of interprofessional education is to create a health workforce with improved levels of teamwork, collaboration, knowledge-sharing and problem-solving, eventually leading to better patient and client outcomes in health settings (Braithwaite et al., 2007).

Interprofessional learning through simulation

Simulation in education refers to the re-creation of an event that is as closely linked to reality as possible. Gaba (2004) defined simulation as a technique, rather than a technology, to replace or amplify real life experiences with guided experiences often immersive in nature to evoke or replicate aspects of the real world, in a fully interactive pattern. Simulation provides a safe learning environment for students to practice, where they are free to make mistakes, correct them and improve the processes of care (Kenaszchuk, MacMillan, van Soeren, & Reeves, 2011). Simulation is the bridge between classroom learning and the real life clinical experience, allowing students to put theory into practice.

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

Interprofessional learning through simulation combines the principles of interprofessional learning and the use of simulation as an educational methodology. Interprofessional learning through simulation provides students with the opportunity to practice working with other health professionals and allows participants to explore collaborative ways of improving communication aspects of clinical care (Kenaszchuk, et al., 2011).

Many of the interdisciplinary team core competencies, such as problem solving, respect, communication, shared knowledge and skills, patient-centred practice, and the ability to work collaboratively (Canadian Interprofessional Health Collaborative, 2010) can all be developed by interprofessional learning through simulation.

Teamwork and interprofessional practice and learning are being recognised as central to improving client care and outcomes and enhancing client safety (Sargent, 2008). Promoting patient safety through team efforts is one of the five core competencies identified by the Institute of Medicine (2003).

In today's healthcare setting, no one health professional can meet all of the client's needs and therefore a healthcare team approach is required. Interprofessional learning through simulation provides learning opportunities to prepare future healthcare professionals for the collaborative models of healthcare being developed internationally (Baker et al., 2008).

How to use this resource package

This interprofessional learning through simulation resource package has been designed to support the facilitation of interprofessional learning among students and practitioners with an interest in developing their skills and knowledge of interprofessional practice.

The package consists of two components: an audiovisual resource and a supporting manual. In order to optimise the learning opportunities from this package it is recommended that participants are firstly introduced to the concepts of interprofessional learning and human factors in health care.

The audiovisual resource demonstrates both sub-optimal outcomes as a result of healthcare interaction between the client and family and the health care provider, as well as a positive outcome through interprofessional collaboration. The package has been created in a format

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

to enable flexibility in its application depending of the educational setting. The audiovisual resource can be viewed in its entirety initially and/or then viewed in sections.
We recommend the following format:

1. Facilitator guided discussion around the concepts of interprofessional learning and human factors in health care.
2. View segment 'Visit to the surgeon' of the audiovisual resource.
3. Facilitator guided discussion around the scenario specific learning competency areas (samples given within manual).
4. View remaining segments of audiovisual resource.
5. Facilitator guided discussion, identifying and discussing the changes witnessed and how this resulted in an alternative outcome. In particular discussion relating the causes of these changes to personal (future) practice is essential in improving interprofessional practice.

Opportunities for further reading and exploration of the scenario are provided in the *Further Information* and *References* sections of this resource manual.

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

Scenario brief

A single mother in her 40's had gastric banding surgery two months ago to combat her ongoing weight problems. She is very independent and determined to succeed post-surgery. She is however not eating nutritious meals and is vomiting regularly. As a result, she has developed a thiamine deficiency and is now showing signs of Wernicke's encephalopathy, a condition which includes symptoms of confusion, memory loss, blurred vision and an unsteady gait. If left untreated, this can eventually develop into Wernicke-Korsakoff syndrome, a life threatening condition.

List of characters

- Dietician
- General Practitioner
- Nurse
- Patient
- Patient's sister
- Registrar
- Surgeon

Key learning competencies

The key learning competencies for this scenario are based on the IpAC Program learning objectives as well as the Canadian Interprofessional Health Collaborative (CIHC) Competency Framework (Canadian Interprofessional Health Collaborative, 2010). The specific competency areas for this scenario are:

- Interprofessional and client centred communication
- Role clarification
- Reflective practice

Interprofessional and client centred communication

The health care team consists of health professionals, the client and the family. The interaction within the health care team demonstrates:

- Communication is authentic, consistent and demonstrates trust.
- Team members demonstrate active listening skills.
- Communication ensures a common understanding of decisions made.

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

- Trusting relationships with clients, families and other team members.
- Other disciplines' roles are promoted and supported to the client/family.

Role clarification

The interaction between the health care team demonstrates:

- Awareness of knowledge and competencies of own role as well as those of other members of the health care team.
- Clear communication of the health care professional's role, knowledge, skills, and attitudes in an appropriate manner.
- Health professionals are respectful and understand the important role of others in the health care team.

Reflective practice

Reflective practice is crucial in continuous development and re-assessment of skills when working in health care. A reflective practitioner:

- Reflects on feedback and integrates changes into practice.
- Reflects on how interprofessional practice impacts on client outcomes.
- Identifies knowledge deficits and seeks clarification.
- Ensures procedures for safety and quality assurance are implemented.

Key discussion points

Visit to the surgeon

- How would you describe the communication between the client and surgeon during the consultation?
- What warning signs did the client exhibit during her consultation with the surgeon?
    - Higher than expected weight loss, unsteady and wide gait, previous episodes of vomiting.
- Why do you think the surgeon did not pick up on these?
    - Looking at paperwork instead of client and misses the stumble.
    - Knowledge of knee issues, assuming this causes unsteady gait.
    - Client covers up memory loss with believable made-up stories.
- How could he have conducted the consultation differently?

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

- What responsibility does the client have for her condition not being detected during the consultation?
    - This question could generate a discussion around self-care; self-management; caring for patients; patients' responsibility for their own health and wellbeing; and health care providers' responsibility for correct information gathering.
- What role, if any, could the sister have had if she participated in the consultation? Would this have been appropriate? Why?

Alternative visit to the surgeon

- What did you notice had changed from Segment 2 of the scenario? How did these changes impact on the final outcome of the consult?
- How does the dynamic of the consultation change with the client's sister in the consult?
- Is it appropriate that the sister is part of this consult?
    - This question could generate a discussion about confirming with a patient whether he or she agrees to the presence of a family member.
- What further questioning does the surgeon do in this scenario? How does this inform his clinical judgement?
- How do you think the client felt in the revised consultation with the surgeon? Why?

Dietitian's consult

- How would you describe the interaction and communication between the client and the dietitian?
- How does the dietitian determine that the client has understood what has been discussed during their consultation? Is there anything else she could have done?
- How does the dietitian demonstrate interprofessional practice?
    - Referral to general practitioner.
    - Enquires about the mental state of the client, but refers to a psychologist for treatment. She does not go outside her scope of practice and knows which health care providers would be able to support this issue for the client.
- Note how the dietitian promotes and supports other health care professionals. What impact will this have on the client's trust in the health care system?
    - No blame towards the surgeon about not being involved prior to the operation.

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

  - Promote visiting the psychologist.
  - Awareness of the need for a referral from a general practitioner.
- What would have enabled the dietitian to work in an interprofessional manner?
  - Complete and correct referral
  - Confidence in scope of practice, in particular in this specific field of work
  - Good working relationship with colleagues

Surgeon's reflection

- Is it appropriate for colleagues to discuss a client or patient?
- What changes is the surgeon intending to implement following this incident? Is this relevant?

Reflection on personal learning

What has this scenario highlighted for your personal (future) practice?

What changes will you make in your personal (future) practice to improve interprofessional and client centred practice?

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

Literature review

Obesity is a growing health concern affecting some 500 million people worldwide (World Health Organization, 2011). The Australian National Health Surveys indicate an increasing prevalence of obesity (defined as a Body Mass Index (BMI) of ≥30kg/m^2) from 13% in 1995 to 18% in 2005 (Australian Bureau of Statistics, 2007). The prevalence of severe or morbid obesity (BMI ≥40kg/ m^2) has been reported as 2-6% of individuals in Canada, USA and UK and is the obesity subgroup that is rising most rapidly (Padwal et al., 2011). In Australia, the prevalence of morbid obesity in 1999-2000 was reported as 1.7% of the population, an increase from 0.6% in 1995 (Department of Health, 2008). Morbid obesity is associated with significant increases in morbidity and mortality, with both physical and psychological consequences (Alvarez-Leite, 2004).

Bariatric surgery is widely regarded as the most effective treatment for morbid obesity in terms of long-term weight loss, and subsequent improvement in obesity-related co-morbidities (such as diabetes, dyslipidaemia and hypertension) and quality of life (Buchwald et al., 2004; Ledoux et al., 2006; National Health and Medical Research Council, 2003; Padwal, et al., 2011; Salas-Salvado et al., 2000). Bariatric surgery is generally indicated for adults with a BMI of ≥40kg/ m^2, or ≥35kg/ m^2 with serious medical co-morbidities, in whom non-surgical methods of weight loss have been tried and failed (National Health and Medical Research Council, 2003). Bariatric surgery for weight loss is becoming increasingly common, with an estimated 350,000 procedures performed globally in 2008 (Buchwald & Oien, 2009).

There are a number of bariatric surgical procedures available for obesity. They can be divided into restrictive (e.g. gastric banding), restrictive/malabsorptive (e.g. Roux-en-Y gastric bypass) and malabsorptive (e.g. biliopancreatic diversion) procedures. The most commonly performed techniques globally are the adjustable gastric band (AGB) and the Roux-en-Y gastric bypass (RYGB) (Buchwald & Oien, 2009). In Australia, the laparoscopic AGB is the most common surgical procedure for obesity with malabsorptive techniques not routinely performed due to their higher complication rates (Department of Health, 2008).

A systematic review of the literature on bariatric surgery identified a mean percentage of excess weight loss of 61% for all patients who had undergone bariatric surgery. This ranged from 41% to 74% of excess weight loss depending on the type of procedure, with the lowest

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

and highest weight loss seen with gastric banding and biliopancreatic diversion (or duodenal switch) respectively (Buchwald, et al., 2004).

However, serious nutritional and metabolic complications following bariatric surgery have been described including Wernicke-Korsakoff syndrome (Salas-Salvado, et al., 2000). Bariatric surgery is associated with impaired micronutrient absorption, with malabsorptive procedures generally associated with more nutritional deficiencies compared to purely restrictive techniques (Alvarez-Leite, 2004). Deficiencies of thiamine (vitamin B1) are among the most frequently described (Coupaye et al., 2009). Patients require lifelong monitoring and supplementation of vitamins and minerals and careful medical and nutritional supervision post-surgery is necessary to prevent nutritional and digestive complications (National Health and Medical Research Council, 2003). Compliance with vitamin and mineral supplementation by patients is generally poor, with reports of micronutrient intake often below 50% of the recommended levels after bariatric surgery (Ledoux, et al., 2006). Even in patients taking daily multivitamins malnutrition can occur, especially in the presence of vomiting which is a common side-effect of bariatric procedures (McMahon et al., 2006). Despite the potential for life-threatening complications, systematic monitoring of the nutritional deficiencies responsible for these complications is not routinely carried out in clinical practice (Coupaye, et al., 2009).

A team approach

Surgery for obesity should only be considered in well-informed, motivated patients who have undergone evaluation by a multidisciplinary team with medical, surgical, psychiatric and nutritional expertise (National Health and Medical Research Council, 2003). Pre-surgical preparation with communication and coordination of services by the multidisciplinary team is essential to minimise the risk of post-operative complications, both during and after the patients' hospital admission (McGlinch et al., 2006). The importance of a good relationship between physician and patient based on regular communication has also been recognised (Escalona et al., 2004).

Ongoing multidisciplinary follow-up post-surgery can reduce the effects of under nutrition and the development of complications after bariatric surgery (Alvarez-Leite, 2004). Specifically, a lack of dietetic and psychiatric follow-up is thought to contribute to reduced

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

compliance to nutritional recommendations and degradation of psychological status increasing the occurrence of complications and reducing quality of life (Folope et al., 2008).

The goals of dietary management following bariatric surgery are to facilitate sustainable eating behaviours conducive to weight loss and to prevent and/or treat nutritional deficiencies. Dietary assessment and education by a dietitian, both pre- and post-operatively, is vital to ensure the nutritional adequacy of the diet, identify food intolerances, and assist with the adoption of healthy eating habits to facilitate weight loss (McMahon, et al., 2006). Coupaye et al. (2009) suggest that severe nutritional deficiencies can be prevented in patients undergoing AGB and gastric bypass surgery, when monitoring and dietary advice is provided.

Psychological assessment helps to ensure patient compliance post-operatively (Makarewicz et al., 2007). Patients who are psychologically unstable prior to surgery are more likely to experience difficulties after bariatric surgery. Therefore, evaluation and treatment of psychological and psychiatric disorders prior to bariatric consultation and close monitoring of psychosocial function after surgery is recommended for all patients (McMahon, et al., 2006).

Additionally, assessment of patients' exercise tolerance provides useful information as those with low exercise capacity have twice the risk of serious post-operative complications than those with normal exercise tolerance (McGlinch, et al., 2006). As sustained behavioural changes in physical activity are vital for long-term weight loss, involvement of an exercise specialist (such as an exercise physiologist) is recommended to develop an individualised activity program based on the patient's musculoskeletal status, exercise tolerance and personal preferences (McMahon, et al., 2006).

Wernicke-Korsakoff syndrome

Wernicke-Korsakoff syndrome is a rare neurological disorder caused by a deficiency of thiamine (vitamin B1), which is associated with significant morbidity and mortality. It comprises two phases; Wernicke's encephalopathy (acute) and Korsakoff's psychosis or syndrome (chronic). Wernicke's encephalopathy was first described by Carl Wernicke in 1881 and is typically characterised by a triad of ophthalmoplegia, mental confusion and ataxia (Truswell, 2000). The estimated mortality rate of Wernicke's encephalopathy is 17% (Sechi & Serra, 2007). About 80% of surviving patients with Wernicke's encephalopathy go

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

on to develop Korsakoff's syndrome, a psychosis first described by Korsakoff in 1887 (Brockington, 2006) and which is characterised by potentially irreversible memory loss and, in the early stages, confabulation (Donnino, Vega, Miller, & Walsh, 2007; Sechi & Serra, 2007). Approximately 25% of patients who progress to Korsakoff's psychosis will require long-term residential care due to organic brain damage (Robinson, 2003).

It wasn't until the 1940's that Campbell and Russel identified thiamine deficiency as a causative factor in Wernicke-Korsakoff syndrome (Sechi & Serra, 2007). While the symptoms of Wernicke's encephalopathy often improve rapidly with administration of thiamine, patients are often left with the permanent brain damage of Korsakoff's syndrome which does not respond well, if at all, to thiamine therapy (Truswell, 2000).

Although thiamine deficiency and Wernicke-Korsakoff syndrome are classically associated with alcohol abuse it can occur in anyone who develops nutritional deficiency (Donnino, et al., 2007). It is increasingly being recognised in other clinical settings that include gastrointestinal and bariatric surgery, hyperemesis gravidarum, anorexia nervosa, cancer, AIDS and renal disease (Sechi & Serra, 2007).

Wernicke's encephalopathy is potentially preventable and treatable however it is frequently misdiagnosed, particularly in non-alcoholic situations (Galvin et al., 2010). Autopsy studies indicate that the diagnosis was missed by routine clinical examination in up to 80% of adult cases (Sechi & Serra, 2007). The literature suggests a prevalence rate from clinical studies of 0.04 – 0.13%, while autopsy studies indicate a much higher rate of 0.8 – 2.8% (Sechi & Serra, 2007), with the highest worldwide prevalence figure occurring in Western Australia (Harper, Gold, Rodriguez, & Perdices, 1989).

The high rate of missed or delayed diagnosis of Wenicke's encephalopathy may be due to a combination of non-specific clinical presentation of the disease and a failure of clinicians to recognise the neurological signs. The complete clinical triad of confusion, ataxia and nystagmus or opthalmoplegia are only present in about 16% of cases and around 19% of patients will present with none of these classical symptoms (Sechi & Serra, 2007). Therefore, sole reliance on this for diagnosis is inadequate. Additional neurological features of the disease are common and may include double vision, paraesthesia, peripheral neuropathy (Bozbora et al., 2000), hypothermia, vestibular dysfunction and coma (Donnino, et al., 2007). Clinician's may mistake symptoms such as confusion, agitation and psychosis

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

as psychiatric in nature further contributing to delays in diagnosis (Chang, Adams-Huet, & Provost, 2004).

The diagnosis relies primarily on clinical symptoms, the severities of which vary greatly between individuals (Donnino, et al., 2007). There are no specific routine laboratory tests available and radiographic findings of the brain are normal in some patients (Singh & Kumar, 2007). While magnetic resonance imaging (MRI) is considered the most valuable method of confirming Wernicke's encephalopathy, it only has a sensitivity rate of 53% thus, in practice, the diagnosis is generally confirmed by the neurological response to thiamine supplementation (Sechi & Serra, 2007).

Loh et al. (2004) describe the early onset of apathetic confusion in patients with acute Wernicke's encephalopathy which may result in patients failing to appreciate or address the onset of symptoms such as double vision or unsteadiness of gait. Not only are these patients likely to be incapable of complying with medical care instructions, it is expected that they would be highly unlikely to seek medical help for their deteriorating health. This is another factor contributing to the underdiagnosis of this condition.

In order to improve the identification of Wernicke's encephalopathy, it has been suggested that more flexible diagnostic criteria be used which includes any two of the following four signs:

1) Dietary deficiencies;
2) Oculomotor abnormalities;
3) Cerebellar dysfunction; and
4) Either altered mental state or mild memory impairment (Feeney & Connor, 2008).

The prognosis for Wernicke's encephalopathy varies from complete recovery within hours of thiamine administration to permanent neurological dysfunction or even death (Sechi & Serra, 2007). It is clear that neurological symptoms resolve more quickly and completely when treatment is instigated early, emphasising the dangers of delayed diagnosis (Chang, et al., 2004). Clinicians may need to improve their knowledge of Wernicke's encephalopathy and its atypical symptoms as well as be aware that patients may give inaccurate histories (Robinson, 2003).

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

The role of thiamine

Thiamine is an essential water-soluble B vitamin absorbed in the small intestine. Because of its short biological half-life of 10 – 20 days, and limited tissue storage, a continuous supply of thiamine is needed to prevent deficiency (Sola et al., 2003; Sriram, Manzanares, & Joseph, 2012). The combination of reduced intake, frequent vomiting and malabsorption seen following bariatric surgery can cause thiamine deficiency to develop (Bloomberg, Fleishman, Nalle, Herron, & Kini, 2005). Thiamine reserves may be depleted within just 20 days of inadequate intake emphasising the importance of early recognition and treatment of deficiency (Sriram, et al., 2012).

Thiamine is an essential cofactor for several biochemical pathways in the brain including carbohydrate metabolism and energy production, lipid metabolism, and production of amino acids and neurotransmitters. In the absence of thiamine lactic acidosis pursues, which if left untreated, leads to the irreversible lesions in the brain and permanent neurological damage seen in Wernicke-Korsakoff syndrome (Sechi & Serra, 2007; Sriram, et al., 2012).

Because of its role in carbohydrate metabolism, thiamine stores are more rapidly depleted during high carbohydrate intakes (such as occurs with intravenous fluid resuscitation containing dextrose or glucose) which may exacerbate acute thiamine deficiency and cause rapid onset of Wernicke's encephalopathy (Iannelli, Addeo, Novellas, & Gugenheim, 2010; Stanger et al., 2008). Refeeding a malnourished patient, whether enterally or parenterally, should therefore commence only after thiamine supplementation (Chang, et al., 2004).

Wernicke-Korsakoff Syndrome and bariatric surgery

Wernicke-Korsakoff Syndrome has been described in obese patients who have undergone malabsorptive bariatric surgery (e.g. gastric bypass) as well as patients treated with purely restrictive procedures such as gastric banding (Makarewicz, et al., 2007; Sola, et al., 2003). A systematic literature review by Aasheim (2008) found the prevalence of Wernicke's encephalopathy after bariatric surgery to be substantially higher than previously reported. Of the 84 cases of Wenicke's encephalopathy included in the study, frequent vomiting was a predisposing factor in 90% of cases. This finding is supported by another systematic review (Singh & Kumar, 2007) that identified vomiting as a risk factor for Wernicke's encephalopathy in 80% of bariatric cases.

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

Wenicke's encephalopathy after bariatric surgery most commonly occurs between 4 and 12 weeks post-operatively (Singh & Kumar, 2007). It generally develops after a weight loss of 13 – 45kg especially in the presence of rapid weight loss. The literature reports an average daily weight loss of 0.36kg in patients who develop the disease (Cirignotta, Manconi, Mondini, Buzzi, & Ambrosetto, 2000). Salas-Salvado et al. (2000) conclude that a weight loss of more than 7kg per month during the first few months after bariatric surgery is suggestive of excessive restriction of intake and may increase the risk of Wernicke's encephalopathy, especially in the presence of vomiting.

It is incorrect to assume that a morbidly obese person is well nourished. A high BMI does not predict risk of malnutrition or refeeding problems (Jones, 2010). In fact, many obese patients have vitamin deficiencies (including thiamine) prior to surgery (Alvarez-Leite, 2004; Coupaye, et al., 2009; Sriram, et al., 2012). Due to the chronic poor eating habits of morbidly obese people it has been suggested that obesity should be considered more as a malnutritional state (Iannelli, et al., 2010). The long-term use of diuretics commonly seen in morbidly obese people prior to bariatric surgery has also been associated with thiamine deficiency (Gollobin & Marcus, 2002). Thiamine deficiency is often missed in practice (Jones, 2010) and it is therefore recommended that serum vitamin (including thiamine) and mineral levels be assessed prior to surgery to minimise nutritional complications in the post-surgical period (Alvarez-Leite, 2004; Chang, et al., 2004; Coupaye, et al., 2009).

A survey of 257 members of the American Society for Bariatric Surgery found that of those patients presenting with acute post-gastric reduction surgery neuropathy (which includes Wernicke's encephalopathy and Korsakoff's syndrome), 29% had thiamine deficiency and 10% were diagnosed with Wernicke's encephalopathy. The disease resolved in 50% of cases (Chang, et al., 2004). Aasheim (2008) reported that about half of the cases of Wernicke's encephalopathy in the literature had incomplete recovery with memory deficits and gait difficulties the most frequent sequela.

Digestive and nutritional complications are common following bariatric surgery. Vomiting occurs frequently in the first 4-6 weeks after surgery, particularly in patients who have undergone AGB, with more than 50% of patients vomiting at least weekly (McMahon, et al., 2006). Ledoux et al. (2006) reported that 80% of their patients with AGB experienced vomiting and/or abdominal discomfort post-operatively compared to 37% of patients who had undergone RYGB. Reasons for vomiting include eating too quickly or too much, consuming

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

excess fluids with meals, eating foods not previously tolerated, or the gastric band being too tight (McMahon, et al., 2006).

Vomiting following AGB can be long-lasting with Coupaye et al. (2009) reporting that 71% of their patients with AGB were vomiting one year after surgery. In this same group of patients, thiamine levels had decreased at one year post-surgery compared to pre-surgery levels, however this failed to reach statistical significance. The number of patients with thiamine deficiency pre-surgery and one year post-surgery was 38% and 57% respectively. Patients were not prescribed a multivitamin supplement.

Vomiting after bariatric surgery appears to be a primary factor in triggering the neurological complications that can occur, and protracted vomiting and weakness should be considered alarming symptoms and treated immediately (Chang, et al., 2004; Cirignotta, et al., 2000; Sola, et al., 2003). As delays in treatment may result in permanent brain damage or death (Galvin, et al., 2010), clinicians need to maintain a proactive approach with a high level of suspicion of thiamine deficiency in preventing and treating patients with this potentially reversible condition (Robinson, 2003).

Because high doses of thiamine are considered safe with relatively few side effects when given on a short-term basis (Chang, et al., 2004; Donnino, et al., 2007), it is suggested that all patients who present with persistent vomiting after bariatric surgery be treated with aggressive thiamine supplementation (Jones, 2010). There is no universally agreed recommendation regarding the optimal therapeutic dose of thiamine for Wernicke's encephalopathy, and the traditional dose of 100mg of parenteral thiamine per day has been contested as insufficient (Donnino, et al., 2007). Initial doses as high as 500mg three times a day given as an intravenous infusion, have been suggested as optimal in restoring thiamine levels and preventing the progression to Korsakoff syndrome, with supplementation continued at lower doses until symptoms have resolved (Sechi & Serra, 2007). Parenteral administration of thiamine is recommended for bariatric patients due to the frequency of vomiting (Galvin, et al., 2010).

Conclusion

The rising prevalence of obesity and its associated co-morbidities is a major health concern worldwide. Bariatric surgical procedures are considered the most effective method to treat

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

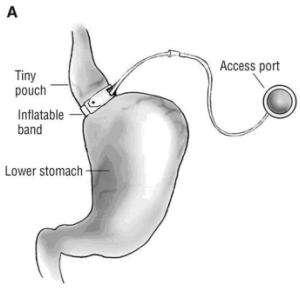
morbid obesity however these are not without complications. Wernicke-Korsakoff syndrome is amongst the most serious of these complications and may result in irreversible neurological disabilities or death. Most commonly seen are patients experiencing protracted vomiting following bariatric surgery causing thiamine deficiency, which is often overlooked or misdiagnosed in practice resulting in life-threatening delays in thiamine therapy. Involvement of a multidisciplinary team with surgical, medical, nutritional and psychological expertise in both the pre- and post-operative period is essential to improve patient compliance and reduce the occurrence of complications resulting from malnutrition. Effective communication and a proactive approach, including ongoing nutritional and metabolic monitoring of patients after bariatric surgery, is required by clinicians to effectively prevent and treat this potentially reversible yet life-threatening condition.

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

Medical glossary and acronyms

AGB

Adjustable Gastric Band



A: Laparoscopic adjustable gastric banding

Also known as **lap banding**.

A restrictive bariatric surgical procedure. A hollow silicone band is placed around the top of the stomach, creating a small pouch and a narrow passage into the larger remainder of the stomach. The band is then inflated with a salt solution, which restricts the amount of food that can be eaten and increases the amount of time it takes for the stomach to empty. The band can be tightened or loosened over time to change the size of the passage by increasing or decreasing the amount of salt solution.

Apathetic

Having or showing little or no feeling or emotion

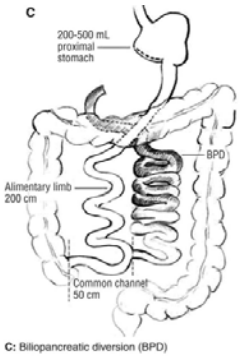
Ataxia

Incapacity to regulate muscle movements, resulting in lack of coordination and unsteadiness.

Bariatric surgery

Gastrointestinal surgery for the treatment of obesity.

Biliopancreatic diversion



C: Biliopancreatic diversion (BPD)

Also known as **duodenal switch**

A predominantly malabsorptive bariatric surgical procedure, which restricts the size of the stomach. It combines removal or exclusion of 2/3rds of the stomach along with a long intestinal bypass which significantly reduces the absorption of fat. The capacity to eat is greater than with other operations, but if fatty foods are overeaten then diarrhoea and foul flatus will result.

BMI

Body Mass Index

BMI (kg/m^2) = weight (kg) / (height (m) x height (m)

Normal BMI range = 18.5 – 24.9 kg/m^2

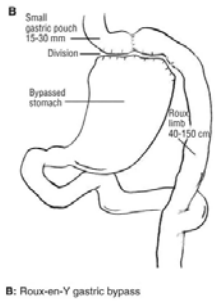
THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

Cerebellar dysfunction	Impairment in walking, balance and/or coordination resulting from damage to the cerebellum (the part of the brain responsible for the control of these functions).
Confabulation	A disorder caused by injury to the brain, where a person creates false memories to fill gaps in their memory.
Diabetes	A chronic condition characterised by high blood glucose resulting from a defect in insulin production. This renders the body incapable of converting glucose into energy.
Dyslipidaemia	Abnormal levels of lipids in the bloodstream (i.e. either too high or too low).
Enteral	A method of delivering nutrition or medication in liquid form directly into the gastrointestinal tract.
Gait	Manner of movement (i.e. walking, running).
Hyperemesis gravidarium	Chronic morning sickness.
Hypertension	A medical emergency involving a severe elevation in blood pressure generally common in stroke or heart attack patients. Hypertension damages the blood vessels and stops the heart from pumping blood effectively. Symptoms include extreme anxiety, chest pain, severe headaches and seizures.
Hypothermia	When the body's core temperature falls below 35°C, which is 2° less than normal temperature. Symptoms include feeling very cold, confusion, dilated pupils, slow breathing and loss of concentration. Hypothermia can be fatal if not treated immediately.
Interdisciplinary teams	A team that is collaboration-oriented. The team meets regularly

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

	to discuss and collaboratively set treatment goals and carry out treatment plans. There is a high level of communication and cooperation among team members (Korner, 2008, p. 2).
Korsakoff syndrome	Also known as **Korsakoff psychosis**. A chronic condition stemming from untreated **Wernicke's encephalopathy**. It is characterized by confabulation and memory loss. In the worst cases, patients are left with brain damage and require long-term residential care.
Lactic acidosis	A buildup of lactic acid in the bloodstream. Symptoms include nausea and weakness.
Laparoscopic surgery	Also known as called **keyhole surgery**. Laparoscopic surgery is a less invasive form of surgery that is performed using several small incisions, or *ports*: one to insert a surgical telescope connected to a video camera, and others to permit access of specialised operating instruments. The surgeon views the operation on a video screen.
Morbid obesity	When a person's **BMI** is 40 or higher, at this point obesity-related conditions can result in physical debilitation or even death. See also **obesity.**
MRI	**Magnetic Resonance Imaging** Medical scanning test which creates pictures of the body, used to detect any abnormalities in the scanned area.
Multidisciplinary teams	A team that is discipline-oriented. Each professional works in parallel, with clear role definitions, specified asks and hierarchical lines of authority (Korner, 2008, p. 2).
Nystagmus	Involuntary rapid eye movement, caused by an abnormality in the brain. Symptoms include blurred or reduced vision.

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

Obesity	A medical condition in which a person is clinically overweight, and thus at risk of serious illnesses such as diabetes and heart disease. See also **morbid obesity.**
Oculomotor	Concerning eyeball movements.
Opthalmoplegia	A weakness caused by a number of neurological disorders affecting the muscles that control eye movement. Symptoms include headaches, drooped eyelids and double vision.
Paraesthesia	Sensation of numbness or tingling.
Parenteral	A method of delivering nutrition intravenously or through the bloodstream in liquid form.
Percentage excess weight loss	Standard terminology used to report the amount of weight lost after bariatric surgery. *% excess weight loss = (weight loss/excess weight) x 100, where excess weight = total preoperative weight – ideal weight*
Peripheral neuropathy	Nerve damage in the peripheral nervous system, which excludes the brain and spinal cord. Symptoms may include the sensation of numbness, tingling, burning pain, or weakness.
Refeeding syndrome	Metabolic disturbances occurring as a result of reinstitution of nutrition to patients who are starved or severely malnourished.
RYGB  B: Roux-en-Y gastric bypass	**Roux-en-Y Gastric Bypass** A bariatric surgical technique that combines gastric restriction and malabsorption. A small stomach pouch is created to restrict food intake. Next, a Y-shaped section of the small intestine is attached to the pouch to allow food to bypass the lower stomach, the duodenum (the first segment of the small intestine), and the first portion of the jejunum (the second segment of the small intestine). This bypass reduces absorption

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

	of nutrients and calories.
Sequela	Any abnormal condition resulting from a prior disease or injury.
Thiamine	Also known as **vitamin B1**. A vitamin which assists in carbohydrate metabolism. Thiamine is found in foods such as grains, meat and nuts. Thiamine deficiency is a commonly occurring risk of bariatric surgery, and if not treated can result in Wernicke-Korsakoff syndrome.
Vestibular dysfunction	A disorder involving problems with balance, caused by an irregularity in the inner ear.
Wernicke's encephalopathy	An acute condition characterized by thiamine deficiency, resulting in mental confusion, ataxia and ophthalmoplegia. If left untreated, patients can develop Korsakoff syndrome. The condition is preventable, but is frequently misdiagnosed. Wernicke's encephalopathy can be the result of a range of conditions or situations, including alcohol abuse, nutritional deficiency, bariatric surgery and cancer.

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

Further information

American Society for Metabolic and Bariatric Surgery (ASMBS)

www.asmbs.org/

The website of the ASMBS, a non-for-profit organisation for research, education, raising awareness and increasing access to treatment of obesity.

Foodtalk

www.foodtalk.com.au

The website of Trudy Williams, an Accredited Practising Dietitian. Contains food and nutrition resources for gastric banding.

Gastric Banding Procedure

www.lapband.com.au

An Australian website by Allergan Inc; Australia Pty Ltd. Allergan are the manufacturers of the Lap-Band® System. The website informs people about the consequences of obesity, and the possible solutions and procedures to control weight.

Great Ideas

www.greatideas.net.au

The website of Amanda Clark, an Advanced Accredited Practising Dietitian. Contains food and nutrition resources for gastric banding.

Obesity Surgery Society of Australia and New Zealand (OSSANZ)

www.ossanz.com.au

Provides information about the types of surgeries available for people with severe obesity, meant to accompany advice given by doctors and surgeons. The website describes the causes and consequences of obesity, as well as the risks and guidelines for surgery.

Weight Loss Surgery

www.weightlosssurgery.com.au

An Australian website by Johnson&Johnson Medical Pty Ltd. Johnson&Johnson are manufacturers of the Swedish Adjustable Gastric Band (SAGB). The website describes the options for weight loss surgery, including the SAGB.

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

References

Aasheim, E. T. (2008). Wernicke encephalopathy after bariatric surgery: a systematic review (abstract). *Annals of Surgery;, 248*, 714-720.

Alvarez-Leite, J. I. (2004). Nutrient deficiencies secondary to bariatric surgery. *Current Opinion in Clinical Nutrition and Metabolic Care, 7*, 569-575.

Australian Bureau of Statistics. (2007). Australian social trends 2007, from http://www.abs.gov.au/ausstats/abs@.nsf/0/4DE3C28315518DCECA25732C002074E4?opendocument

Baker, C., Pulling, C., McGraw, R., Dagnone, J. D., Hopkins-Rosseeeld, D., & Medves, J. (2008). Simulation in Interprofessional education for patient centred collaborative care. *Journal of Advanced Nursing, 64*(4), 372-379.

Bloomberg, R. D., Fleishman, A., Nalle, J. E., Herron, D. M., & Kini, S. (2005). Nutritional deficiencies following bariatric surgery: what have we learned? *Obesity Surgery, 15*, 145-154.

Bozbora, A., Coskun, H., Ozarmagan, S., Erbil, Y., Ozbey, N., & Orhan, Y. (2000). A Rare Complication of Adjustable Gastric Banding: Wernicke's Encephalopathy. *Obesity Surgery, 10*(274-275).

Braithwaite, J., Westbrook, J. I., Foxwell, A. R., Boyce, R., Devinney, T., Budge, M., et al. (2007). An action research protocol to strengthen system-wide inter-professional learning and practice. *BMC Health Services Research, 13*(7), 144.

Brockington, I. (2006). Wernicke-Korsakoff syndrome. *Archives of Women's Mental Health, 9*, 58-59.

Buchwald, H., Avidor, Y., Braunwald, E., Jensen, M., Pories, W., Fahrbach, K., et al. (2004). Bariatric surgery: a systematic review and meta-analysis. *JAMA, 292*, 1724-1737.

Buchwald, H., & Oien, D. M. (2009). Metabolic/bariatric surgery worldwide 2008. *Obesity Surgery, 19*, 1605-1611.

Canadian Interprofessional Health Collaborative. (2010). A National Interprofessional Competency Framework. Vancouver: University of British Columbia.

Canadian Interprofessional Health Collaborative (CIHC). (2008). Knowledge transfer and exchange in interprofessional education: synthesizing the evidence to foster evidence-based decision-making. Vancouver, Canada: University of British Columbia.

Centre for the Advancement of Interprofessional Education. (2002). Defining IPE, from http://www.caipe.org.uk/about-us/defining-ipe

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

Chang, C. G., Adams-Huet, B., & Provost, D. A. (2004). Acute post-gastric reduction surgery (APGARS) neuropathy. *Obesity Surgery, 14*, 182-189.

Cirignotta, F., Manconi, M., Mondini, S., Buzzi, G., & Ambrosetto, P. (2000). Wernicke-Korsakoff encephalopathy and polyneuropathy after gastroplasty for morbid obesity. *Archives of Neurology, 57*, 1356-1359.

Coupaye, M., Puchaux, K., Bogard, C., Msika, S., Jouet, P., Clerici, C., et al. (2009). Nutritional consequences of adjustable gastric banding and gastric bypass: a 1-year prospective study. *Obesity Surgery, 19*, 56-65.

Department of Health, Western Australia. (2008). Morbid Obesity Model of Care. Perth: Health Networks Branch, Department of Health, Western Australia.

Donnino, M. W., Vega, J., Miller, J., & Walsh, M. (2007). Myths and misconceptions of Wernicke's encephalopathy: what every emergency physician should know. *Annals of Emergency Medicine, 50*, 715-721.

Escalona, A., Perez, G., Leon, F., Volaric, C., Mellado, P., Ibanez, L., et al. (2004). Wernicke's encephalopathy after Roux-en-Y gastric bypass. *Obesity Surgery, 14*, 1135-1137.

Feeney, G. F. X., & Connor, J. P. (2008). Wernicke-Korsakoff syndrome (WKS) in Australia: no room for complacency. *Drug and Alcohol Review, 27*, 388-392.

Folope, V., Hellot, M. F., Kuhn, J. M., Teniere, P., Scotte, M., & Dechelotte, P. (2008). Weight loss and quality of life after bariatric surgery: a study of 200 patients after vertical gastroplasty or adjustable gastric banding. *European Journal of Clinical Nutrition, 62*, 1022-1030.

Freeth, D. S., Hammick, M., Reeves, S., Barr, H., & Koppel, I. (2005). *Effective interprofessional education: development, delivery, and evaluation*. Noida: Blackwell Publishing.

Gaba, D. (2004). The Future Vision of simulation in healthcare. *Quality in Health Care, 13*(1), 2-10.

Galvin, R., Brathen, G., Ivashynka, A., Hillbom, M., Tanasescu, R., & Leone, M. A. (2010). EFNS guidelines for diagnosis, therapy and prevention of Wernicke encephalopathy. *European Journal of Neurology, 17*, 1408-1418.

Gollobin, C., & Marcus, W. (2002). Bariatric beriberi. *Obesity Surgery, 12*, 309-311.

Harper, C., Gold, J., Rodriguez, M., & Perdices, M. (1989). The prevalence of the Wernicke-Korsakoff syndrome in Sydney, Australia: a prospective necropsy study. *Journal of Neurology, Neurosurgery and Psychiatry, 52*, 282-285.

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

Iannelli, A., Addeo, P., Novellas, S., & Gugenheim, J. (2010). Wernicke's encephalopathy after laparoscopic Roux-en-Y gastric bypass: a misdiagnosed complication. *Obesity Surgery, 20*, 1594-1596.

Institutes of Medicine. (2003). Health professions education: A bridge to quality. Retrieved from www.iom.edu/CMS/3809/46345914.aspx

Jones, L. (2010). Overweight but undernourished: refeeding syndrome after bariatric surgery. *Bariatric Times, 7*(3), 18-21.

Kenaszchuk, C., MacMillan, K., van Soeren, M., & Reeves, S. (2011). Interprofessional simulated learning: short term associations between simulation and interprofessional collaboration. *BMC Medicine 2011, 9*(29).

Korner, M. (2008). Analysis and development of multiprofessional teams in medical rehabilitation. *GMS Psychosocial Medicine, 5*(13), 2.

Ledoux, S., Msika, S., Moussa, F., Larger, E., Boudou, P., Salomon, L., et al. (2006). Comparison of nutritional consequences of conventional therapy of obesity, adjustable gastric banding and gastric bypass. *Obesity Surgery, 16*, 1041-1049.

Loh, Y., Watson, W., Verma, A., Chang, S., Stocker, D., & Labutta, R. (2004). Acute Wernicke's encephalopathy following bariatric surgery: clinical course and MRI correlation. *Obesity Surgery, 14*, 129-132.

Makarewicz, W., Kaska, L., Kobiela, J., Stefaniak, T., Krajewski, J., Stankiewicz, M., et al. (2007). Wernicke's syndrome after sleeve gastrectomy. *Obesity Surgery, 17*, 704-706.

McGlinch, B. P., Que, F. G., Nelson, J. L., Wrobleski, D. M., Grant, J. E., & Collazo-Clavell, M. L. (2006). Perioperative care of patients undergoing bariatric surgery. *Mayo Clinical Proceedings, 81*(suppl 10), S25-S33.

McMahon, M. M., Sarr, M. G., Clark, M. M., Gall, M. M., Knoetgen, J., Service, F. J., et al. (2006). Clinical management following bariatric surgery: value of a multidisciplinary approach. *Mayo Clinical Proceedings, 81*(suppl 10), S34-S45.

National Health and Medical Research Council. (2003). Clinical practice guidelines for the management of overweight and obesity in adults Retrieved March 2, 2012, from http://www.health.gov.au/internet/main/publishing.nsf/Content/obesityguidelines-index.htm

Padwal, R., Klarenbach, S., Wiebe, N., Birch, D., Karmali, S., Manns, B., et al. (2011). Bariatric surgery: a systematic review and network meta-analysis of randomized trials. *Obesity Reviews, 12*(602-621).

Robinson, K. (2003). Wernicke's encephalopathy. *Emergency Nurse, 11*, 30-33.

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM

Salas-Salvado, J., Garcia-Lorda, P., Cuatrecasas, G., Bonada, A., Formiguera, X., Del Castillo, D., et al. (2000). Wernicke's syndrome after bariatric surgery. *Clinical Nutrition, 5*, 371-373.

Sargent, S., Loney, E. & Murphy, G. (2008). Effective Interprofessional Teams: "Contact is not enough" to build a team. *Journal of Continuing Education in the Health Professions, 28*(4), 228-234.

Sechi, G. P., & Serra, A. (2007). Wernicke's encephalopathy: new clinical settings and recent advances in diagnosis and management. *The Lancet Neurology, 6*, 442-455.

Singh, S., & Kumar, A. (2007). Wernicke encephalopathy after obesity surgery: a systematic review (abstract). *Neurology, 68*, 807-811.

Sola, E., Morillas, C., Garzon, S., Ferrer, J. M., Martin, J., & Herndandez-Mijares, A. (2003). Rapid onset of Wernicke's Encephalopathy following Gastric Restrictive Surgery. *Obesity Surgery, 13*, 661-662.

Sriram, K., Manzanares, W., & Joseph, K. (2012). Thiamine in nutrition therapy. *Nutrition in Clinical Practice, 27*, 41-50.

Stanger, Z., Brunner, A., Leuenberger, M., Grimble, R. F., Shenkin, A., Allison, S. P., et al. (2008). Nutrition in clinical practice – the refeeding syndrome: illustrative cases and guidelines for prevention and treatment. *European Journal of Clinical Nutrition, 62*, 687-694.

Truswell, S. (2000). Australian experience with the Wernicke-Korsakoff syndrome. *Addiction, 95*, 829-832.

World Health Organization. (2010). Framework for action on interprofessional education and collaborative practice. In D. Hopkins (Ed.). Geneva: World Health Organization.

World Health Organization. (2011). Obesity and overweight fact sheet no 311 Retrieved March 2, 2012, from http://www.who.int/mediacentre/factsheets/fs311/en/index.html

THIS CLINICAL TRAINING INITIATIVE IS SUPPORTED BY FUNDING FROM THE AUSTRALIAN GOVERNMENT UNDER THE INCREASED CLINICAL TRAINING CAPACITY (ICTC) PROGRAM